O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
Oil and Gas: Overarching Issues	Lease and permit incentives for improving air quality on public lands	Y		Y- CE said could look at emissions, not cost (8/06)
	Economic-Incentives Based Emission Trading System (EBETS)	Y		
	Tax or Economic Development Incentives for Environmental Mitigation	Y		
	Voluntary Partnerships and Pay-back Incentives: Four Corners Innovation Technology and Best Energy-Environment Management Practices (IBEMP)	Y		
Oil and Gas: Turbines	Upgrade Existing Turbines to Improved Combustion Controls (Emulating Dry LoNOx Technology) where feasible	Y		
Oil and Gas: Stationary RICE (Small and large engines)	Industry Collaboration (new title)	Y		Y-CE to integrate updated EI (8/06)
	Install Electric Compression	Y	*See Also Power Plants-Overarching/Crossover*	Y- CE will look @ emission benes, not cost (8/06)
	Optimization/Centralization	Y		
	Follow EPA New Source Performance Standards (NSPS) *for existing engines*	Y		Y-CE to assess AQ benefits in 4C (8/06)
	Adherence to Manufacturers' Operation and Maintenance Requirements	Y		
	Use of SCR for NOx control on lean burn engines	Y		Recommended 12/11
	Use of NSCR / 3-way Catalysts and Air/Fuel Ratio Controllers on Stoiciometric Engines	Y		Recommended 12/11
	Use of Oxidation Catalysts and Air/Fuel Ratio Controllers on Lean Burn Engines	Y		Recommended 12/11

O&G Section	Mitigation Option	Written (Y/N)	If No, Rationale	Tagged for CE?
	Install Lean Burn Engines	Y		Recommended 12/11 Perhaps modify mit/op to incorporate CE support re: rich v lean burn? Need clarification- mean change out small rich burn with larger lean burn??? Or limit horsepower change to above 300hp for lean burn.
	Interim Emissions Recommendations for Stationary RICE	Y		Recommended 12/11 (Quantify NOx and ammonia emissions) Ammonia may wait until KSU study completed
	Emission limit on existing engines (1g/hp hr and 2g/hp hr)	N	Will highlight the emissions reductions in the other mitigation option drafts but will not be treated as a separate category. Depending upon the draft mitigation options, this item may remain separate but this will be determined later.	
	Replacing ignition systems to decrease false starts	N	This option is generally covered in the Operation and Maintenance mitigation option. *See Adherence to Manufacturers' Operation and Maintenance Requirements above.* Insignificant air quality benefit.	
	Replace piston rod packing (pumps)	N	This was deleted as a separate item and instead will be included with O&M section; however it wasn't included in this section	

O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
	Minimize (control?) engine blow downs	N	This was deleted by the drafting team since it is not an emission control technology	
	Utilize exhaust gas analyzers to adjust AFR	N	This was included in the Oxidation Catalysts and AFRC on Lean Burn Engines option.	
	Smart AFRC (air-fuel-ratio-controller)	N	Included in the other AFRC options	
	Replace gas engine starters with electric air compressors	N	This was deleted by the drafting team since it is not an engine emission control technology	
	Provide training for field personnel on engine maintenance with regard to AQ considerations	N	Jen to add expansion sentence into OM Mit/Opt Paper	
	Next Generation Stationary RICE Control Technologies	Y		Recommended conf call 12/12
Oil and Gas: Rig Engines	Diesel Fuel Emulsions	Y		
	Natural Gas Fired Rig Engines	Y		
	Selective Catalytic Reduction (SCR)	Y		Y-NOx + Ammonia on visibility- CE said can look at NOx 98/06)
	Selective Non-Catalytic Reduction (SNCR)	Y		Recommended 12/11
	Implementation of EPA's Non Road Diesel Engine Rule – Tier 2 through Tier 4 standards	Y		Y- CE can calc emissions from T2-4 stds (8/06)
	Interim Emissions Recommendations for Drill Rigs	Y		Recommended 12/11 What types of assumptions needed for participation in voluntary program? Difficult to quantify based on option alone. #all new rigs? #for all rigs?

O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
	Analysis of all drill rigs – replace the dirtiest 20%	N	Will reference in Tier 2-4 Mitigation Option Development, but also move to overarching discussion to determine the priority on rig engine reductions	
	Electric powered drill rig	N	Not selected by the drafting team due to low feasibility around availability of electricity	
	Various Diesel Controls, including: Duel fuel (or Bi-fuel) diesel and natural gas Bio diesel PM Traps Free gas recirculation Fuel Additives Liquid Combustion Catalyst Lean NOx Catalyst Low NOx ECM Exhaust Gas Recirculation (EGR)	Y	These are all combined into the Diesel Control paper *– cross over to Other Sources?*	
Oil and Gas: Mobile and Non-Road	Fugitive dust control plans for dirt/gavel road and land clearing	Y	*See also Other Sources- Fugitive Dust Mitigation Plan (Coming Soon)*	
	Use produced water for dust reduction	Y		
	Pave roads to mitigate dust	Y		
	Automation of wells to reduce truck traffic	Y	*See also Optimization and Automation in E&P Dehydrators Below*	Y-CE look @ elec benes; feasible to assess EF data for unpaved roads (8/06)
	Reduced Vehicular Dust Production by Enforcing Speed Limits	Y	*Crossover to Other Sources- Phased Construction / Operations?*	Y- CE to give direct emissions, no cost (8/06)
	Reduced Truck Traffic by Centralizing Produced Water Storage Facilities	Y		CE noted cost/econ beyond resources
	Reduced Vehicular Dust Production by Covering Lease Roads with Rock or Gravel	Y		Y-emissions from dirt v gravel, no cost (8/06)
	Reduced Truck Traffic by Efficiently Routing Produced Water Disposal Trucks	Y		Y- CE to give direct emissions,

O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
	Use Alternative Fuels and Maximize Fuel Efficiency to Control Combustion Engine Emissions	Y		
	Utilize Exhaust Emission Control Devices for Combustion Engine Emission Controls	Y		
	Exhaust Engine Testing for Combustion Engine Emission Controls	Y		
	Reduce Trucking Traffic in the Four Corners Region	Y	*Tagged for Cum/Effects Group*	
Oil and Gas: E&P Tanks	BMP: close hatches, maintain seals, enardo valves	Into V5 Y		
	Install VRU	Into V5 Y		
	Inert Gas Blanket	Into V5 Y		
	Install Flares	On Hold	Myke Lane is researching viability, don't have much flash at E&P sites, more viable at CS and GP (Still researching)	
	Floating Roof Tanks	Into V5 Y		
	Mufflers	N	Does not apply to AQ	
	Centralized Collection for Existing Sources	N	Not feasible for retrofit in SJB	
	Centralized Collection for New Sources	Coming	Walt will write for new development, Christi asst. Coming 12/15ish	
Oil and Gas: E&P Dehydrato	Control glycol pump rates	Coming	Dave Brown will write Coming 12/15ish	

O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
rs/Separators/ Heaters	Replace high bleed pneumatics w/ low bleed pneumatics	Coming	Myke Lane…David Bays will check – see if Myke wants to add to Bill H's paper on air actuated below Coming-Myke will collab w/Kellie anticipate 12/15ish	
	Optimization and automation	Coming	D Brown: add in something on this in paper above *See also Automation of wells to reduce truck traffic in Mobile and Nonroad above*	
	Low/Ultra low NOx burners	Coming	Brit Benko D Brown will check	
	"Quantum Leap" dehy units	Y		
	Insulated Vessels	Into V5 Y		
	Combustors for still vents	Coming	Dave Brown Coming 12/15ish	
	VRU	Coming	Dave Brown Coming 12/15ish	
	Desiccant Dehys	Y		
	Centralized Dehys	N	Already or will be incorporated in other papers on centralization (Jen will check)	
Oil and Gas: E&P Wells	Flareless Completions (Green Completions)	Y		
	Plunger Lifts	Coming	Dave Brown Coming 12/15ish	
	Plunger optimization	Coming	Dave Brown – combined w/ above Coming 12/15ish	
	Comparing/trade-offs between flaring and venting	Yes		
Oil and Gas: E&P	Air actuated pneumatics	Into V5 Y		

O&G Section	Mitigation Option	Written (Y/N) If No, Rationale		Tagged for CE?
Pneumatics/ Controllers/ Fugitives	Optical imaging to detect leaks	Y		
	Electrification of starters and valves	?	Off GasStar site? Jen/Andy check	
	Directed inspection and maintenance program	?	Check to combine with optical imaging – Jen/Andy	
	Electric Chemical pumps	Into V5 Y	Bruce Gantner	